

Polaroid would have had to add more positive sheet coating capacity. A new coater required at least three years to build. Therefore, Polaroid would have had to begin construction in 1976. No evidence shows that it could have done so. As in the case of film assembly machines, Polaroid would have had to forecast the need for more positive sheet long before demand materialized. I do not believe Polaroid could have predicted the need for more positive sheet coating machines in 1976.

In 1980, the most constraining area of production was Polaroid's ability to coat the negative base for Time Zero film. Negative coating machines require at least four years to build. Even if Polaroid had started another machine at the beginning of the infringement period, it could not have been productive until mid-1980. I find that Polaroid could not have planned so far in advance and therefore would not have been able to increase negative coating capability in 1980.

1981-1985. According to Mr. Cook's analysis, Polaroid was most seriously constrained in 1981 by its capacity to produce batteries. Polaroid's counsel questioned Mr. Cook about whether his opinion took into consideration that Polaroid had another battery assembly facility, W-45, which it had closed in 1980. Mr. Cook answered that he believed Polaroid management would not have invested capital to re-open the old facility because they expected the new P-80 machines to be ready soon. Although Mr. Cook's analysis seems plausible, I find that Polaroid reasonably could have re-opened the old facility. No new machines were required, as in the case of film assembly or sheet coating. Mr. Cook testified that re-opening the old facility simply required updating the machines and hiring new employees to operate them.

| | |
|-----------|---------------------------|
| 1976 | sufficient to meet demand |
| 1977 | 5,571,000 packs |
| 1978 | 49,000 packs |
| 1979 | 1,486,000 packs |
| 1980 | 775,000 packs |
| 1981-1985 | sufficient to meet demand |

B. Camera Manufacturing Introduction

Manufacturing each hard-bodied Polaroid camera during the infringement period required assembling approximately 125 different parts supplied by between fifty and seventy-five different outside vendors located around the world. Sub-assembly and final assembly was done by hand. [FN33] The resources needed for making the cameras were piece parts, workers, factory space, and some assembly and test equipment. After assembly,

Mr. Cook did not specifically explain how he thought the combined demand would effect this decision. It is reasonable to conclude that Polaroid could have taken this simple step. Of course, any costs associated with re-opening the facility will have to be accounted for in the lost profits calculation.

Giving Polaroid every benefit of the doubt, I find that the company could have manufactured enough film to satisfy demand from 1981 to 1985. Mr. Smith testified that in the case of 100% of demand, Polaroid could have increased capacity slightly from 1979 to 1981 and completely satisfied demand from then on. My findings are more generous to Polaroid both because I am not sure whether Mr. Smith took into account that Polaroid may have planned better for the OneStep, and because I believe that given enough time, the record shows that Polaroid's manufacturing operations were impressive. The parties disagree about the conversion of machines to autofilm and Spectra which began in 1982 and by 1985 accounted for a total of nine machines. I find that Polaroid still would have converted these machines but by 1981 it would have had adequate time to build and install replacement. The cost of this build-up is included in the lost profits calculation.

*56 I also conclude that Polaroid could have added sufficient sheet and negative coating capability by 1981. Of course, the lost profits calculation takes into account the cost of those machines.

Conclusion

I find Polaroid's ability to manufacture additional film packs is as follows: [FN32]

Polaroid tested the product, packaged and shipped it.

Three critical factors influenced the number of cameras Polaroid could produce: (1) the suppliers' ability to produce parts; (2) the number of workers employed; and (3) the rate at which Polaroid employees could assemble cameras. The parts were produced by special tooling machines such as dyes, jigs, fixtures, and molds, and so the number of tooling machines largely determined how quickly parts could be produced. In 1976, Polaroid's

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suppliers had tooling to produce 15,000 sets of Pronto! parts per day on a five-day schedule. By June 1978, tooling capacity had tripled and suppliers were producing up to 50,000 Pronto! and OneStep parts per day. To increase tooling, Polaroid had to authorize the funds and order the tools. Depending on the complexity of the tool, it could take considerable time before the tool was ready and even longer before additional parts reached Polaroid from the supplier. Within the constraints of an existing tooling compliment, the rate at which the supplier could purchase raw materials and the number of hours it could run the machines determined the level of output.

Polaroid was able to increase the size of its workforce at a significant rate. In the period 1977-1978, Polaroid hired over 100 people each week in the camera division. Still, depending on the job, it took between one and six weeks to train new workers traversed the learning curve. During the years of peak demand, the attrition rate was high in the camera division, partly because workers transferred to the higher-paying film division, and partly because hiring at such great numbers increased the likelihood of employing workers who only stayed for a short period of time or who were not suited for the job.

The assembly rate was not only affected by new workers but also by the product mix, how much overtime the assemblers had worked, the amount of product that had to be re-worked, and the typical "technical surprises" which slowed down the operation.

1. Polaroid's In-Place Capacity

*57 Polaroid's chief camera manufacturing witness was Howard J. Fortner. From 1971 through 1980, Mr. Fortner held positions in the camera engineering and folding camera manufacturing areas at Polaroid; his responsibility for the production of Polaroid's hardbody integral cameras began in 1981. Except regarding his analysis of Polaroid's manufacturing capacity in Scotland, Mr. Fortner did not review any of the deposition testimony of Polaroid executives responsible for camera production and planning during the critical time period of 1976-1980. Mr. Fortner also did not review the depositions of any of Polaroid's parts suppliers, nor did he review any of the contemporaneous records concerning the supply of camera parts to Polaroid. (TR 1812-13).

Using his own estimates of the production rates Polaroid could achieve, Mr. Fortner constructed two scenarios. First he analyzed both Polaroid's in-place capacity and potential capacity if additional tooling had been authorized eight months earlier. In a third scenario, Mr. Fortner prepared an expansion scheme which could meet the combined demand in every year. This required

advancing Polaroid's capital investment decisions twelve months.

Mr. Fortner's in-place capacity analysis calculated the increased production Polaroid could have achieved without changing the timing of any decisions to increase tooling. Despite overwhelming testimony that in the years 1976-1978 Polaroid was producing as many cameras as it could, Mr. Fortner testified that Polaroid could have manufactured more cameras by assuming that the highest historical daily production rate--for example, in January 1977--would be matched every month thereafter until a higher rate was achieved. [FN34] In this example, production next historically exceeded the January 1977 rate in June 1977. Thus, in Mr. Fortner's scenario, the January rate would apply in February, March, April, and May. Historically, however, production did not equal the January rate in those months.

Mr. Fortner presented no sound basis for this assumption. On cross-examination, he tried to explain that his chosen production rate reflected typical efficiency factors, yet he also acknowledged that the rate reflected months of peak efficiency. (TR 1880-81). Mr. Fortner also assumed that the historical fluctuations attributable to schedule changes would not occur in his scenario. (TR 1881-82). Yet, the cross-examination showed that these fluctuations were sometimes caused by events beyond Polaroid's control or resulted from problems that would have occurred even without competition from Kodak. (TR 1851-900). When confronted with the fact that his analysis did not take into account reduced efficiency resulting from the introduction of the complicated Sonar camera, Mr. Fortner conceded his assumptions were "a little less reasonable than I thought." (TR 1989).

A large portion of the excess capacity Mr. Fortner was able to squeeze out of the historical capacity in the early years came from assuming the highest historical production rate would apply in months where Polaroid traditionally curtailed production in accordance with its "seasonalization" policy. Polaroid always built up its inventory before the Christmas selling season and lowered it during the first part of the year. Mr. Fortner confirmed that Polaroid's policy of seasonalizing production was prompted not by Kodak but rather by the requirements of the marketing operation. (TR 1749). Even when running flat out and unable to meet demand in 1978, Polaroid seasonalized its production. (DF 25,329; PT 2274). Still, Mr. Fortner admitted:

*58 And what we showed in our first scenario was that we could, in fact, make some more cameras but we had to make them early in the year.

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(TR 1892).

In the years 1977 and 1978, Mr. Fortner's in-place analysis also assumed that Polaroid could increase its parts supply by twenty percent by asking its vendors to work six instead of five days. While the record is uncontroverted that Polaroid's suppliers were willing to do almost anything for Polaroid, Mr. Fortner did not know that at least one critical supplier was already working seven days a week. (TR 1964-79). Another was working six days just to support Polaroid's five day schedule. (TR 1964-79). Mr. Fortner's assumptions in this regard directly contradict the record and discredit his assessment of in-place capacity in those years.

Mr. Fortner concluded that by running the vendors six days a week, not seasonalizing production, and somehow achieving peak efficiency at all times, Polaroid could have manufactured 1,751,000 more cameras in the years 1976- 1978. This conclusion is based on unsupported assumptions and is not credible.

"Could v. Would" Revisited (Again). In his second scenario, Mr. Fortner assumed that Polaroid would have made each of the decisions it did historically to increase tooling about eight months earlier:

Based upon the fact that the OneStep camera was going to sell for less money than the Pronto camera, we made--similar to our pack camera lines, we made the assumption that we would bring the tooling authorization to 30,000 a day forward from when it was actually done until--to the point when we started development of the OneStep camera. So we moved that tooling authorization from December of 1977 to April of 1977.

(TR 1775-76). Polaroid's counsel elicited from Mr. Fortner that he had been somewhat involved in the camera division's decisions to request additional tooling. But, the camera division based its requests on sales forecasts from the marketing division. In order to move the tooling decision up in time, either Mr. Fortner is making assumptions about what forecasts marketing would have given the camera division, or he is offering his own opinion about what Polaroid would have forecast. Either way, his opinion is not well-supported. While it is reasonable to believe that alone in the market Polaroid might have planned the OneStep introduction better, Mr. Fortner is not qualified to offer an opinion about how Polaroid would have predicted sales. It is not his area of experience or expertise. Upon cross-examination, Mr. Fortner further muddled the waters by testifying that he was only trying to address the question of what additional cameras Polaroid *could* have made, not what it *would* have made. (TR 1920).

In his third scenario, Mr. Fortner admitted that he just counted backwards in time to the dates upon which tooling authorizations would have to have been made in order to manufacture the combined demand. (TR 1972). He concluded that the entire process had to be moved up twelve months. Given the extensive evidence of the complex factors involved in Polaroid's decisions to add capital, Mr. Fortner's calculation, which by definition ignores those factors, is not helpful to the Court except as a theoretical exercise.

*59 Mr. McNamara presented yet another scenario which accelerated the tooling levels by eighteen months. He did so based upon the same testimony by Mr. Booth which I discussed in the film manufacturing section. For the same reasons I delineated there, I find that testimony unreliable. I also find that Polaroid could not have predicted sales or planned with such accurate foresight.

Both Polaroid's machine operation parameters and starting date scenarios are flawed. Even if one part of the scenario was plausible, it would fail because of the other.

Kodak's expert in this area was Mr. Frank Zaffino. At the time of the trial, Mr. Zaffino had more than twenty-six years experience in camera manufacturing. In the course of his career, he has been directly involved in every aspect of the camera manufacturing process, including camera assembly, tool manufacturing, parts procurement, capacity planning, and production planning. From 1976 to 1978, Mr. Zaffino was directly responsible for the manufacture of Kodak's instant cameras. For his analysis of Polaroid's camera manufacturing capacity, Mr. Zaffino undertook an extensive review of all of the relevant testimony, depositions, and evidence. Mr. Zaffino personally inspected Polaroid's facility at Norwood.

Mr. Zaffino worked from the same series of sales forecasts as Mr. Cook--those devised by Mr. Brown to reflect what Polaroid executives would have forecast if the company was alone in the market and experiencing various degrees of incremental demand. Based on his review of Polaroid's decision patterns, Mr. Zaffino determined what capacity planning decisions Polaroid's management would have made if faced with Mr. Brown's forecasts for each of the three demand scenarios.

Mr. Zaffino built a production model which incorporated these various decisions. He analyzed the availability of three key camera parts: the cone, the door, and the electronics flex circuit. Using Polaroid's actual lead times for increasing tooling for these parts, actual cycle times for obtaining these parts from vendors under expedited conditions, and actual scrap rates for these

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parts, and using the actual time it took Polaroid to assemble each camera, information obtained directly from Polaroid records, Mr. Zaffino determined the number of cameras Polaroid would have been able to manufacture each month and identified the particular resource that would have constrained production in any given month. Under each scenario, Mr. Zaffino concluded that Polaroid would not have been able to manufacture enough cameras to meet total incremental demand in 1976-1979 and 1981, but would have been able to do so in every other year of the infringement period.

Mr. Zaffino's analysis is simple, thorough, and sound. His model closely tracked Polaroid's actual production. (DF 61,229). The analysis accurately reflects manufacturing realities by using reasonable lead times and actual efficiency rates. When in doubt, the model incorporates assumptions that favor Polaroid. Unfortunately, Mr. Zaffino based his models on demand levels contrary to my findings and did not perform an in-place analysis or a 100% demand scenario.

Conclusion

***60 1976.** The portion of Mr. Fortner's opinion concerning the eight-month advance scenario incorporates information about Polaroid's capacity most similar to the facts as I have found them. Even in that scenario, however, Polaroid would be unable to increase camera manufacturing capacity in 1976. (PT 2236B). Therefore, the Court is left with an in-place capacity analysis which concludes that Polaroid could have manufactured 256,000 cameras more in that year. Of course, as I discussed above, I find that testimony unreliable because it overstates efficiency and eliminates seasonalization. Under Kodak's fifty percent scenario, Mr. Zaffino concludes that Polaroid could have manufactured 85,000 more cameras in that year. Left with no other alternative, I believe the best approach is to choose the middle ground

| | |
|------|-----------------|
| 1977 | 928,500 cameras |
| 1978 | 8,166 cameras |
| 1979 | 247,666 cameras |
| 1980 | 129,166 cameras |

1981-1985. If I was required to find Polaroid's precise camera manufacturing capacity in these years, I would be seriously taxed: neither proffered analysis is correct or helpful. With one summary calculation carried forward for every year after 1980, Mr. Fortner concluded that Polaroid's in-place capability was sufficient to meet combined demand. According to Mr. Zaffino, however, Polaroid would fall short in 1981 no matter what the demand, due to problems with the Sun introduction. I do

between these witnesses. This approach compensates for the flawed assumptions on both sides. Therefore, I find that Polaroid could have manufactured 170,500 additional cameras in 1976.

1977-1980: The effect of film production constraints on camera manufacturing. As a matter of policy, Polaroid, like Kodak, sold only as many cameras as it believed it would have the film to support. For instance, because of film manufacturing limitations, Mr. McCune decided in the fall of 1978 to limit the number of cameras Polaroid offered for sale in both 1978 and 1979. (TR 249-50; 494-97). On October 10, 1978, Mr. McCune reported to the Polaroid Board of Directors that: "We will have to limit the number of cameras we sell this year because we cannot make enough film to keep up with projected demand." (PT 2078). Similarly, Mr. Booth wrote to Mr. McCune on November 1, 1978 that "we should control the number of cameras we sell in 1979 in a manner similar to the way it has been done this year." (PT 2079).

I have found that Polaroid would have been significantly limited in its ability to produce more film from 1977 to 1980. Accordingly, the company would have limited the number of cameras it manufactured and sold. By using a conservative film "burn rate"--that is, the amount of film used by each camera every year--and not including the film that would be required by cameras sold in other years, Mr. Zaffino calculated that Polaroid would have limited cameras sales so that at least six packs of film were available for each camera produced in a given year. I adopt his findings. The burn rate constraints sales to a greater degree than any independent manufacturing constraint in either party's analysis. I find that Polaroid would have manufactured the following number of additional cameras in the following years:

not find his analysis persuasive. In every Kodak demand scenario, Polaroid is able to meet the reduced demand for cameras from 1982 to 1985. I cannot ferret out exactly how demand affects Mr. Zaffino's calculations in those years. It may be that he believes that by 1982, Polaroid would be able to keep up with whatever additional demand it faced.

***61** Fortunately, a precise resolution of this problem is

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not necessary. According to my findings, Polaroid would not have made a profit on additional camera sales after 1979. (See Parts V and VI). In order to comply with the statute, I must award Polaroid a reasonable royalty on those sales. (See Part VII). Therefore, Polaroid's manufacturing capability in these years is irrelevant to lost profits on cameras. It would only be significant if the constraints were such that film sales, which remain in the black throughout the infringement period, would be affected. Generally, I find that Polaroid could have manufactured most of the cameras. Enough time has elapsed that Polaroid could have increased tooling, developed other suppliers, and hired sufficient people to meet the demand.

V. Costs

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B. Film Manufacturing Costs Conclusion

C. Non-Manufacturing Costs

SADA and MRE & A Costs

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Legal Principles

The lost profits calculation determines "the difference between [the patent holder's] pecuniary condition after the infringement, and what his condition would have been if the infringement had not occurred." Aro Mfg. Co., 377 U.S. at 507 (quoting Yale Lock Mfg. Co. v. Sargent, 117 U.S. 536, 552 (1886)). Once the issues of demand and capability are settled, one common method for determining lost profits is the incremental income method.

The incremental income approach recognizes that typically, the cost of producing additional units of the

patented product is not as great as the cost of producing the first. Paper Converting Mach. Co., 745 F.2d at 22. This approach separates the costs the patent owner historically incurred into fixed and variable components. Generally, the patent owner would incur the variable costs in producing additional volume but, unless new investment is required, would not incur those costs which are fixed and already paid. *Id.* Incremental costs are subtracted from incremental revenue in order to determine lost profits. The incremental income method for determining the cost of making the infringer's sales has been widely used in determining patent infringement damages. See, e.g., State Indus., 883 F.2d at 1579-80; Lam, Inc., 718 F.2d at 1059.

The parties agree that this approach is appropriate for the bulk of this case. Both parties also acknowledge that some additional investment would be required and accounted for these costs separately as "scale-up" or "special" costs.

Factual Findings and Conclusions

A. Camera Manufacturing Costs

Polaroid and Kodak agree that material costs, duty, and warranty are entirely variable parts of camera costs, but they disagree about the variability of payroll and overhead costs. They also disagree about whether some costs that Polaroid excluded from its analysis, such as research and development expenditures and certain period costs, should have been included and their variability assessed. There is also confusion about how Polaroid accounted for some costs: Polaroid included duty in its non-manufacturing costs estimate instead of the "cost of sales" portion; Polaroid's analysis of camera manufacturing costs may or may not have included warranty. Finally, while Kodak claims that Polaroid completely excluded packaging variability costs from both camera and film costs, Polaroid claims these costs were included.

***62 Variability of Payroll and Overhead.** Mr. McNamara was Polaroid's expert on costs. Mr. McNamara and his team from Arthur Young analyzed the fixed and variable portions of Polaroid's payroll and overhead costs in a sample year, 1985, by using the account analysis method. This method involves examining accounts at the general ledger level and determining whether that cost is fixed or variable. Polaroid personnel assisted the McNamara team with some of this analysis. After determining that the cost elements and the ratio of each element to total spending in both 1976 and 1981 were similar to 1985, the team felt confident using their 1985 analysis to predict what costs would increase with volume in each year from 1976 to 1985.

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Mr. Kenneth Stringer, a retired partner of the accounting firm of Deloitte Haskins and Sells, presented Kodak's analysis of manufacturing costs. Mr. Stringer analyzed the variability of Polaroid's payroll and overhead costs by the historical method, which operates by plotting costs against volume and estimating the relationship. Mr. Stringer performed a "high/low" estimate, which compared the cost/volume ratio at the points of highest and lowest volume in a certain time period. He also performed a regression analysis to estimate the cost/volume relationship. As in Professor Fisher's and Professor Baumol's models, the regression is a statistical technique for determining the relationship between two variables. Mr. Stringer presented ten different regressions based on different types of cost and volume data. Mr. Stringer's results were substantiated by contemporaneous Polaroid documents that used similar analyses or reach similar results. (DF 35,327; DF 25,570; DF 61,242).

I find Mr. Stringer's analysis much more accurate, credible, and appropriate than Mr. McNamara's analysis. First, I do not believe account analysis is the best method for cost accounting in these circumstances. The method, by definition, depends on subjective assessments by parties or experts, and this leaves it open to considerable bias. Mr. McNamara's conclusion can be no better than the hundreds of individual decisions his team made when classifying costs. Of course, everyone on his team and all those at Polaroid who helped them, knew that this study was being done for this litigation. More importantly, the Court cannot judge the objectivity of Mr. McNamara's analysis because it is totally lacking documentation. Mr. McNamara submitted no work papers or notes of any kind and did not even list the Polaroid personnel he consulted. (TR 3861-62; TR 10637; DF 61,458R). On cross-examination, when the results of his analysis were questioned because of internal inconsistencies, Mr. McNamara was unable to articulate the reasons for his team's conclusions. (See, e.g., TR 3582-90). This problem was exacerbated by the fact that Polaroid only performed a full analysis for one year. For these reasons, I simply cannot rely on Mr. McNamara's conclusions.

*63 On cross examination, Kodak pointed out several other problems with Mr. McNamara's work. He misapplied the payroll and overhead percentages from the account analysis to the standard costs used in computing the bottom line estimates. For instance, the engineering department payroll appears as "payroll" in the general ledger but is called "overhead" in the standard costs. (DF 61,458A, Tab 17). This misapplication reduced Mr. McNamara's estimate of variable payroll and overhead costs.

Applying variability percentages based on 1985 general ledger data to standard payroll and overhead costs created another problem: the general ledger included costs that are not included in "standard costs," such as period costs, development costs, and costs relating to products other than non-folding integral cameras. As a result, Mr. McNamara leaves the gate with a variability percentage of less than 100% before he even begins to analyze the costs that comprise non-folding camera standard costs. The denominator of the fraction contains costs that Mr. McNamara excluded from the numerator. The most obvious examples of this denominator problem were certain project materials and labor costs relating to the development of the Spectra camera that were included in the denominator but do not appear in the numerator.

Mr. Stringer's analysis is more objective and accurate. Historical data are objective facts; estimates based on the historical relationships between cost and volume are therefore much less subject to the bias of the estimator. The only significant criticism of the regression technique--which may affect Mr. Stringer's analysis--brought to my attention is that the regression may capture the effect of an unidentified variable operating during the same time period. Because I am interested in determining how Polaroid *could* have performed in the past, any historical factor, so long as it is unrelated to Kodak's entry, is appropriately included. Moreover, if, as Mr. McNamara claims (PT-2367 at 17,32), Polaroid's manufacturing processes did not change significantly during the period 1976-1985, there is even more reason to look to historical trends in volumes and costs.

Exclusions. Mr. McNamara excluded period costs and certain other costs from his variability analysis because he determined that these costs did not relate directly to manufacturing and because they were generally discretionary in nature. Examples of excluded period costs are capital write-offs, excess tooling, idle space and equipment, non-product payroll, and moving expenses. Certain development costs were also excluded because they did not relate to integral instant products or because they were non-recurring. Examples of excluded development costs are the costs for diversified product development, integral instant product inception, and Ireland start-up. Mr. McNamara concluded that these costs would not have increased (and in fact, may have decreased) with the manufacture of additional integral instant cameras and film.

*64 Mr. Stringer analyzed these exclusions and determined that they were fifty percent variable. He agreed that the development costs were properly excluded but thought that some of the period costs, such as the cost

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of producing replacement parts for obsolete camera models that had been altered or taken out of production, would increase with volume.

In this matter, I credit Mr. McNamara's conclusions because they are soundly reasoned and supported. Other than his belief that some of the costs would vary, Mr. Stringer did not offer any support for his determination that the costs would be fifty percent variable.

I return now to the parties' dispute about whether Polaroid included packaging variability costs in its analysis. "Packaging variability" covers material costs, greater or less than anticipated in the standard cost, that result from selling camera units as kits or in different packaging configurations. Historically, it was accounted for in Polaroid's "cost of sales." Mr. McNamara claimed, however, that since the costs related to packaging changes requested for marketing purposes, they were included in his analysis of selling, advertising, distribution, and administrative ("SADA") costs. Kodak claims that Polaroid omitted it entirely from its analysis.

Considering all the evidence on this point (e.g., TR 11074; 3413-14), I find that Polaroid did omit these costs. I credit Mr. Stringer's opinion that these costs were 100% variable and should have been included in Polaroid's incremental cost.

Certain Classification Problems. Mr. McNamara and Mr. Stringer agreed that duty and warranty are entirely variable costs. (TR 3127; 3411-12; DF 10,741). Polaroid included duty costs in its SADA category even though it was historically included in the "cost of sales." Manufacturing costs plus duty and warranty are typically referred to as "cost of sales." This is what most executives think of as manufacturing costs although it does include some costs incurred outside the factory. Because I have adopted the portion of Kodak's analysis that includes duty, I will not double-count it in non-manufacturing costs.

The question of warranty costs is more significant. During its cross-examination of Mr. Stringer, Polaroid suggested that domestic warranty costs were included in Mr. McNamara's payroll and overhead costs (TR 10843-50), a possibility Mr. Stringer noted in his report and in his testimony. Mr. McNamara stated in his report (PT 2387 at 38), support papers (DF 61,743) and testimony (TR 3124-25; 3410), however, that he transferred warranty costs from manufacturing costs to corporate overhead. Mr. Stringer included an additional amount for all warranty costs but acknowledged that if Mr. McNamara did not remove domestic warranty costs from his payroll and overhead totals, the additional cost should

be reduced by sixty cents.

Polaroid's post-trial brief again argues that at least sixty cents of the warranty cost was included in Mr. McNamara's analysis and is therefore double-counted in Kodak's analysis. Given the almost universal confusion on this matter, I am giving Polaroid the benefit of the doubt and have reduced Mr. Stringer's estimate by sixty cents (which leaves an additional fifty-five cents for international warranty costs).

**65 Special Costs.* Both parties recognized that Polaroid would incur certain additional investment costs if attempting to meet the combined demand. Mr. McNamara's "scale-up" costs averaged twenty-eight cents per camera (PT 2367A, Tab 3) and Mr. Stringer's "special" costs averaged fifteen cents per camera. (DF 61,458R, Tab 14). Mr. Stringer used Mr. Zaffino's fifty percent scenario capital costs for his 100% or "Panduit" scenario cost estimates but acknowledged that this figure underestimated the investment required. (TR 10665). Despite Kodak's suggestion in its post-trial brief that the special costs should be doubled for the 100% scenario, Mr. Stringer did not testify to that and the capital investment under the fifty percent scenario is the cost estimate most consistent with my findings about what Polaroid would have done to meet the combined demand. (See Part IV). Therefore, I have used the special costs Mr. Stringer included in his 100% estimate.

Conclusion

I find that the incremental cost per camera that Polaroid would have incurred is best approximated by Mr. Stringer's year-by-year costs in Tab 14 of DF 61,458A, minus 4.4%. The 4.4% represents the percentage reduction when sixty cents in warranty and sixty-one cents for excluded costs are subtracted from his overall average cost estimate of \$27.64 per camera.

B. Film Manufacturing Costs

My discussion of camera manufacturing costs also applies to film manufacturing costs. Overall, I find that Mr. Stringer's analysis is more objective and reliable. I find that he properly included packaging variability but improperly included fifty percent of period costs.

Unlike camera costs, there is no dispute that Mr. McNamara excluded warranty costs in his manufacturing cost estimate for film. Mr. Stringer appropriately added this variable cost to his estimate. Duty costs which Polaroid accounted for in non-manufacturing costs were also correctly added to his estimate.

I have found that Polaroid would have needed and would have invested substantial additional capital in its film

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manufacturing operation in order to meet the combined demand. If the costs for constructing additional negative and positive sheet coating and film assembly machines are added to Mr. Stringer's fifty percent capital costs scenario, these costs total approximately fifty cents per camera.

Conclusion

I find that the incremental cost per film pack that Polaroid would have incurred is best approximated by Mr. Stringer's year-by-year cost estimates found at Tab 25 of DF 61,458A, plus 9.5%. The additional 9.5% represents the percentage increase when two cents in improper exclusions are subtracted and an additional twenty-eight cents in special costs (twenty-two cents are already included) are added to his average cost estimate of \$2.74 per film pack.

C. Non-Manufacturing Costs

Non-manufacturing costs consist of marketing, general and administrative, and research and development costs. Polaroid also included duty and warranty in this category although those costs are typically included in "cost of sales" figures. Kodak claims that profit sharing and income taxes must also be accounted for in this category but Polaroid objects to their inclusion on legal grounds.

*66 Because I have already included duty and warranty in manufacturing costs in the previous section, I will not consider them now. I will consider profit sharing and income taxes separately. First, I will discuss the majority of these costs, termed selling, advertising, distribution, and administrative ("SADA") costs by Polaroid and marketing, research, engineering and administrative ("MRE & A") costs by Kodak.

SADA and MRE & A Costs. Polaroid historically spent about thirty percent of sales revenue on overhead costs, minus research and development costs. Mr. McNamara concluded that Polaroid's historical SADA costs for instant photography products were 31.02% of domestic sales and 30.65% of international sales. Kodak concluded that Polaroid's historical MRE & A cost worldwide was 38.3% of sales, but Kodak included research and development costs (8.6% of sales), which Mr. McNamara excluded. Mr. McNamara also included "other marketing costs" (which included duty and some warranty and amounted .99% of domestic sales and 1.68% of international sales) which Kodak treated as part of "cost of sales." Adjusting the relative amounts of those costs produces SADA/MRE & A estimates of close to thirty percent of sales revenue.

Mr. McNamara and his team performed an incremental cost analysis for SADA/MRE & A costs similar to the one

they performed for manufacturing costs. Based on their review of Polaroid's 1985 general ledger accounts and consultations with Polaroid personnel, the McNamara team predicted how increased volume would have affected costs. As they did with manufacturing costs, the team compared the elements of costs and the relationship of those costs to total spending in two other years, 1976 and 1981. Again finding similar results, the team applied the 1985 percentages to each year of the infringement period. The McNamara team concluded that, in connection with incremental sales, Polaroid would have incurred incremental SADA costs at 12.98% of net revenue for domestic sales, and 16.72% for international sales. Polaroid treated research and development costs as fixed.

Kodak's analysis of Polaroid's marketing and other non-manufacturing costs was presented by Professor Robert N. Anthony. Professor Anthony has taught and written extensively on management control of costs. He has been responsible for cost control as a director of two large public corporations as a trustee of the Dartmouth-Hitchcock Medical Center and Colby College. Professor Anthony also served as Assistant Secretary of Defense from 1965 to 1968, with responsibilities for a considerable budget. Professor Anthony studied Polaroid management's goals and performance in controlling non-manufacturing spending by examining contemporaneous documents, trial and deposition testimony, and Polaroid's financial records for 1976-1985. It was his conservative estimate that Polaroid's incremental non-manufacturing expenses would have equalled thirty percent of incremental revenues.

*67 Professor Anthony concluded that because Polaroid management projected devoting thirty percent of sales revenue to MRE & A and looked at MRE & A in total, they could not have budgeted less on incremental volume. The projected goal is well substantiated in the record (*see, e.g.,* PT 2272; DF 40,282; DF 35,317), although Polaroid was often unable to meet it. After 1979, when actual revenue was lower than planned, the overhead percentage was higher because Polaroid consistently overestimated revenue and overhead spending largely depends on estimated revenue. (TR 11785). After 1979, Polaroid revenues declined. Professor Anthony testified that when revenues decline it is more difficult to control expenses, a phenomenon known as "cost stickiness." (TR 11785). Because Polaroid would have faced the same revenue pattern even without Kodak, Professor Anthony believed that Polaroid could not have spent less in trying to meet the combined volume.

As is typical of this litigation, the parties disagree about how the legal standard should be applied to these facts.

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Polaroid argues that the only relevant costs are those that it *necessarily* would have incurred. Mr. McNamara excluded costs Polaroid could have chosen to forego. Kodak claims that Polaroid's revenues should be reduced by those costs it *would* have incurred (because of the "stickiness" of overhead and inaccurate forecasting and planning), whether those costs, in hindsight, really were necessary. As is also typical of this litigation, the difference amounts to little when the facts are examined.

It is not a matter of law whether the costs should be based on actual volume or whether projected volume and planning should be the basis; it is a matter of fact. The record is uncontroverted that overhead is a cost intimately related to planning, both at Polaroid and within other corporations. (TR 11778-79). Polaroid's overhead spending was tied not only to sales volume, but also to sales forecasts, and Polaroid's particular management style. Even after Kodak left the market, the ratio of incremental MRE & A to incremental revenues was thirty-eight percent. (DF 61,688A, Tab 33). Kodak's analysis, which closely examines the relationship between Polaroid's historical planning and overhead spending, is more compelling than Polaroid's, which disregards this relationship by looking, after the fact, at which costs might be fixed and which variable.

There are other problems with Mr. McNamara's analysis. I find the same problems here as in the team's analysis of manufacturing costs: for all SADA costs except media, sales promotion and transportation, the variability classifications are subjective and undocumented. For example, in concluding that salesforce costs were only eleven percent variable, Mr. McNamara did not look at historical spending patterns (TR 3844) or salesforce levels (TR 3807), and did not read the depositions of Polaroid marketing personnel (TR 3799-800) or review contemporaneous documents (TR 3754; 3835-40). Mr. McNamara did not find it necessary to speak with either Polaroid's marketing controller or head of consumer marketing. (TR 3810). I cannot rely on what appear to be, in the face of considerable contrary evidence, clearly arbitrary decisions.

*68 Nor can I fully adopt Professor Anthony's analysis. His estimate included research and development costs because he discovered that a significant portion of engineering and some research expenses supported Polaroid's ongoing business rather than new product development. He concluded, therefore, that research and engineering expenses would have increased at the same rate--8.6% of sales revenue--as they did historically. Yet, he acknowledged that forty percent of the 8.8% would have been spent on new product development. By definition, these costs are fixed and already paid.

Polaroid had already spent all the money on developing new products it needed to meet the combined demand. Professor Anthony reduced the 38.3% historical MRE & A expenses to thirty percent, in part to take into consideration any benefit that Polaroid could have realized from new products. He does not concede that Polaroid would have avoided these expenses.

Professor Anthony's reduction from 38.3% to thirty percent appears both confusing and arbitrary. I am not sure exactly what the reduction excludes. Because I find that research and engineering costs for new products are costs that would not have increased with additional volume, I must reduce his figure. I find that Polaroid would have spent twenty-eight percent of sales revenue on MRE & A costs. The two percent reduction reflects my conviction that Professor Anthony's basic analysis is accurate but that certain research and development costs should be excluded. It also reflects my belief that Polaroid could have achieved some small savings in overhead on these incremental sales.

Profit Sharing. Kodak argues that the monies Polaroid would have had to pay to its employees under its profit sharing plans should be deducted as costs from its profit. As benefits to its employees, polaroid offered the Polaroid Incentive Compensation Plan and the Profit-Sharing Retirement Plan. (DF 13,322A). These plans called for payments equal to fifteen percent of Polaroid's profits before taxes and profit sharing, after a deduction of an amount equal to ten percent of shareholder's equity.

There is no question that if Polaroid had made additional qualifying profits, it would have paid the amounts due under the profit sharing plans. However, I am unable to determine that amount without engaging in improper speculation. Not only would the profit sharing amount be subject to change (and did change during the infringement period), the amount of capital available for profit sharing depends upon the amount Polaroid paid its shareholders in dividends from year to year. Professor Anthony admitted that he had no way of determining whether or how Polaroid might have changed its dividend or profit sharing formulas if it had actually received additional profits during the infringement period. (TR 12057-60). All doubts in this matter must be resolved against the infringer. *Lam, Inc.*, 718 F.2d at 1065; *Story Parchment Co.*, 282 U.S. at 563.

*69 Moreover, even if I had a sound basis for applying the profit-sharing plans to Polaroid's additional profits, I could not do so. The plans themselves were not admitted into evidence and although the basic formula for profit sharing is quite simple, with no evidence the court cannot discern the appropriate amounts of the variables. On the

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record before me, for example, I cannot determine the amount of shareholder's equity in the "but for" Kodak world.

Income Taxes. The issue of whether Polaroid's profits and royalties should be reduced by the amount of taxes the company would have paid in each year is most crucial to the interest calculation. Therefore, I discuss it in Section X.

VI. LOST PROFITS CALCULATION

Incremental Camera Revenue

Polaroid would have obtained the revenue on each camera unit sold by Kodak constrained only by its marketing and manufacturing capacities. Considering the largest constraint on its ability to make sales in each year, Polaroid would have been able to make the camera sales listed in Appendix II [omitted]. In 1976, the limiting constraints were marketing factors: lost sales in Latin America and South Africa. From 1977 to 1980, the most significant constraint was Polaroid's film manufacturing capacity. From 1981 to 1983, Polaroid's lost sales resulted from its limited success in the premium channel, the Middle East, Latin America, and South Africa. In 1984 and 1985, the same factors limited Polaroid's ability to make all of Kodak's sales, except that Polaroid was not limited in the premium channel.

Polaroid is entitled to the incremental revenue it would have obtained on these, minus the costs. Two methods were presented at trial for determining the amount of revenue Polaroid would have received. Both methods attempted to "translate" Kodak sales into Polaroid sales. In other words, because Polaroid did not sell the same camera models as Kodak, the parties determined what equivalent Polaroid models Kodak buyers would have purchased but for the infringement.

Professor Buzzell presented a detailed model-by-model translation for Kodak. (DF 61,091). This allowed the Court to translate all of the sales and arrive at a weighted average revenue per camera Polaroid would have received in each year. [FN35] Testifying for Polaroid, Mr. McNamara grouped Kodak cameras into two groups: low-and medium-range. He arrived at a Polaroid average revenue in each year for each of these categories by weighting the revenues according to the traditional mix of low-and medium-priced cameras Polaroid actually sold. Mr. McNamara then multiplied that revenue by the corresponding numbers of low-and medium-range cameras Kodak actually sold.

Kodak's method produced revenues for Polaroid considerably lower--up to \$5 per camera in some years--than the revenues Kodak actually realized on each

camera. This is an unlikely and unfair result. Polaroid's method produced per camera revenues that were sometimes higher and sometimes lower than those produced by Kodak's method. Although Polaroid's method is preferable to Kodak's, I find Mr. McNamara's two-group classification overly simplistic. This method does not account for what consumers paid for Kodak cameras, and thus ignores evidence that price was a critical factor in consumer's purchase decisions. To give Polaroid the benefit of the doubt, I used whichever analysis yielded the greatest revenue. This method produced average per camera revenues that I found reasonable and consistent with the record as a whole. I then multiplied this number by the number of camera sales. Both calculations are reflected in Appendix II [omitted].

Incremental Camera Costs

*70 The incremental costs Polaroid would have incurred on the additional camera sales were detailed in Section V. I subtracted both the incremental manufacturing costs and the incremental non-manufacturing costs which were expressed as a percentage of revenue. They are also listed in Appendix II [omitted].

Lost Profits on Cameras

Polaroid could have realized a profit on additional camera sales in the years 1976-1979. The overall margin and total profit appear in Appendix II [omitted]. From 1980 onward, Polaroid would have lost money. This pattern is consistent with the general historical pattern of profit and loss. Because I have found that Kodak's entry into the market did not cause any price erosion, it is not surprising that incremental sales would become unprofitable at about the same time they did historically. The margins roughly follow the historical pattern of OneStep margins and the pattern in Professor Anthony's report. (DF 61,688, Tab 1).

Although Polaroid earned a slight profit in 1979, its profit is below what I have found to be reasonable royalty in this case. (See Section VII). Pursuant to 35 U.S.C. § 284, I have awarded Polaroid a reasonable royalty on all Kodak's camera sales in 1979-1985.

Incremental Film Revenues

Polaroid is entitled to lost profits on those film sales it would have made in Kodak's absence. The factors which would have affected film sales were Polaroid's ability to manufacture film and the effect of lost camera sales on film sales. To arrive at the number of film sales Polaroid would have lost in each year from each lost camera sale in that same year, I subtracted a "burn rate" of fifteen packs per camera. (TR 2626). Inevitably, this leads to some inaccuracies because not all of packs would have been

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bought in the year the camera was purchased. Therefore, in the early years, the burn rate overestimates lost film sales and in the later years, it underestimates them. I have also considered evidence that some camera sales, such as the premium cameras, would not "burn" as much. The difference is insignificant. On average, I believe that the number is fair.

The incremental film sales are set forth in Appendix III [omitted]. In 1976, film sales were lost due only to marketing factors. In 1977-1980, film sales were constrained by Polaroid's ability to manufacture film. From 1981 to 1985, only Polaroid's marketing capabilities constrained film sales.

The average revenue per film pack is simple to determine because Kodak and Polaroid film was priced essentially the same throughout the infringement period. The film revenue per pack contained in Appendix III [omitted] is taken from Mr. McNamara's report. (PT 2367, Tab 3). Revenue per pack was multiplied by the number of incremental sales to arrive at incremental revenue.

| Year | Profit |
|-------|---------------|
| 1976 | \$16,484,089 |
| 1977 | \$9,605,722 |
| 1978 | \$92,875 |
| 1979 | \$1,625,833 |
| 1980 | \$708,379 |
| 1981 | \$47,699,169 |
| 1982 | \$56,893,666 |
| 1983 | \$51,636,093 |
| 1984 | \$42,346,817 |
| 1985 | \$20,944,876 |
| Total | \$248,037,519 |

VII. REASONABLE ROYALTY

Legal Principles

In Section V, I concluded that Polaroid proved lost profits in connection with some, but not all of the infringing sales. The patentee can prove its damages by showing lost profits on infringing sales, or if lost profits are inadequate or cannot be proved, by a reasonable royalty. Panduit Corp. v. Stahl Bros. Fibre Works, Inc., 575 F.2d 1152, 1157 [197 USPQ 726] (6th Cir.1978); 35 U.S.C. § 284. The Federal Circuit has stated that "[a] reasonable royalty ... is ... the floor below which damages shall not fall." Stickle v. Heublein, Inc., 716 F.2d 1550,

Incremental Film Costs

Incremental costs were detailed in Section V. Incremental manufacturing costs were subtracted from incremental revenues and non-manufacturing costs were calculated as a percentage of revenue.

Lost Profits on Film

*71 Polaroid is entitled to lost profits on film in every year of the infringement period. The profit margins are not as high as Polaroid achieved during the pack era but the nature of the market and Polaroid's operations had changed significantly. As best I can judge from the evidence presented, these profit margins are roughly consistent with what Polaroid earned during the infringement period. Overall, I find these incremental profits consistent and reflective of the record as a whole. They are detailed in Appendix III [omitted].

Total Lost Profits

Polaroid's lost profits for camera and film resulting from Kodak's infringement are as follows:

1561 [219 USPQ 377] (Fed.Cir.1983) (quoting Bandag, Inc. v. General Tire Co., 704 F.2d 1578, 1583 [217 USPQ 977] (Fed.Cir.1983)). To make Polaroid whole, as directed by section 284, in addition to lost profits Polaroid is entitled to a reasonable royalty on further types of Kodak sales: those infringing sales for which Polaroid would have realized little or no profit and those infringing sales that Polaroid would not have been able to make because of limits in its manufacturing and marketing capabilities. A combined award is justified where the lost profits alone do not account for all of the infringing sales. See Gyromat Corp. v. Champion Spark Plug Co.,

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735 F.2d 549, 551 [222 USPQ 4] (Fed.Cir.1984) (affirming a combined lost profits/reasonable royalty award determined by a master); *Bio-Rad Laboratories, Inc. v. Nicolet Instrument Corp.*, 739 F.2d 604, 615-16 [222 USPQ 654] (Fed.Cir.1984) (affirming combined lost profit/reasonable royalty damages awarded by a jury); *TWM Mfg. Co. v. Dura Corp.*, 789 F.2d 895, 898 [229 USPQ 525] (Fed.Cir.1986) (affirming a master's award that included lost profits for certain years and a reasonable royalty for others); *Radio Steel & Mfg. Co. v. MTD Products, Inc.*, 788 F.2d 1554, 1555 [229 USPQ 431] (Fed.Cir.1986) (affirming a combined lost profits/reasonable royalty award); *Amstar Corp. v. Envirotech Corp.*, 823 F.2d 1538 [3 USPQ2d 1412] (Fed.Cir.1987) (affirming an award of damages based on lost profits for some sales and a reasonable royalty for others).

*72 There are two generally accepted approaches to the determination of a reasonable royalty. The first requires an analysis of evidence bearing on Kodak's entry into the market, including its own internal profit projections. This approach is a straightforward examination of the infringer's motives as evidenced by its own documents and testimony. *TWM Mfg. Co., supra*. A second approach is the construction of a hypothetical negotiation between a willing licensor and willing licensee. Certain factors that may be considered in this method are set forth in *Georgia-Pacific Corp. v. United States Plywood Corp.*, 318 F.Supp. 1116 [166 USPQ 235] (S.D.N.Y.1970), modified and *aff'd*, 446 F.2d 295 [170 USPQ 369] (2d Cir.), cert. denied, 404 U.S. 870 [171 USPQ 322] (1971). Those factors are refined somewhat and the proposed analytical process of reaching a reasonable royalty are addressed in a more realistic fashion in *Panduit*, 575 F.2d at 1158, 1164. This Court is not the first to find the task of determining a reasonable royalty difficult:

Determining a fair and reasonable royalty is often, as it was here, a difficult judicial chore, seeming often to involve more the talents of a conjurer than those of a judge.

Fromson v. Western Litho Plate & Supply Co., 853 F.2d 1568, 1575 [7 USPQ2d 1606] (Fed.Cir.1988).

Whatever method is adopted, the objective is the same--to provide adequate compensation for the infringement. "Thus, the calculation is not a mere academic exercise in setting some percentage figure as a 'royalty'. The determination remains one of damages to the injured party." *Fromson*, 853 F.2d at 1574 (emphasis original); *TWM Mfg. Co.*, 789 F.2d at 899.

Findings and Conclusions

On the issue of reasonable royalty, like every issue in this case, competing experts were pitted against each other. Polaroid's expert, Professor Fisher, testified that, after considering the significance and duration of the patents in suit, the lack of an acceptable non-infringing substitute, Polaroid's policy of not licensing, and its forecasts for the profitability of the SX-70 system, Polaroid would not have licensed Kodak except at a royalty rate of 72.5% for cameras and 63.4% for film. Professor Fisher concluded that these numbers "would have been far greater than the royalty rates Kodak would have been willing to pay." (TR 5330-31). Kodak's expert, Paul Wylie, testified that the parties, at a hypothetical negotiation, would have agreed on a non-exclusive royalty rate of five percent. These negotiations would have been based on the anticipated profits projected in a February 27, 1976 Kodak forecast. (DF 61,724).

Resolving such glaring conflicts between experts is not new in this case. Here, as in earlier instances, I have assessed the credibility of the witnesses and reviewed the factual underpinnings that are relevant to *this issue* and reached my independent judgment of a reasonable royalty. In general, despite his credentials, I have rejected Professor Fisher's proposed royalty rates as unsupported by the historical context of this case, unlikely in light of the parties' long-standing relationship and simply unrealistic in light of its effect on Kodak's potential earnings as well as its effect on Polaroid's profits over the period involved. While he presented various scenarios, the one urged by Polaroid in post-trial submissions, a 72.5% royalty rate on cameras and a 63.4% royalty rate on film, would have required Kodak, even at its rosiest projection, to operate an all-out effort in order to achieve a disastrous loss. Even his more modest constructs resulted in great losses, although, as Professor Fisher described it, at an "accounting profit." The same figures would exceed pre-tax earnings in every year of the infringement period and would have elevated Polaroid to the pinnacle of successful American corporations.

*73 While I do not accept his bottom line, I found Mr. Wylie's presentation to be more sound and his analysis better reasoned, supported by relevant precedent, and more closely aligned with the facts. I also found his experience, training, and education as a patent examiner, an attorney, and teacher in the field of patent licensing to be superior to that of Professor Fisher. The royalty of five percent that Mr. Wylie proposes would have provided Polaroid with thirty-three percent of Kodak's profits as projected in February 1976, shortly before Kodak's entry. This rate would have provided Polaroid with an 18.9% return on the sales it expected to lose to Kodak, almost twice as much as Polaroid earned in the years 1972-1975 when it faced no competition from any

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source. Polaroid had projected, if alone in the market, a return of fourteen percent, but between 1986 and 1988, after Kodak left the field, its return was only one percent. A five percent royalty would have been acceptable to Polaroid even knowing its patents were infringed, because it provided Polaroid with a higher financial return than it could reasonably have expected on its own sales and would have done so on a risk-free basis.

Against this backdrop, I conclude a reasonable royalty rate is achieved under either the *TWM Mfg. Co.* or *Georgia-Pacific Corp.* approach.

1. The Analytical Approach

In February 1976, Kodak projected operating gross profits of \$611,594,000 on projected revenues of \$3,775,784,000. The gross profits included the cost Kodak incurred from 1970-1975. (DF-61,724). This ongoing study was the final and most reliable projection before April 1976, the date of Kodak's entry. It was the result of continuing drastic reductions in profitability projections from December 1970 when Kodak had projected revenues of \$6.3 billion and gross profits of \$4.5 billion. Using this approach, Mr. Wylie testified that, in his experience, a royalty rate that provides the patent holder with one-quarter to one-third of the licensee's anticipated process is fair. Mr. Wylie's approach results in a royalty rate of between four percent and 5.3%.

Using an earlier Kodak profit projection from November 1975--with its higher estimates of anticipated profits--excluding costs incurred before 1976, and computed based on 100% of anticipated profits, Polaroid calculated a royalty rate of 27.6% of Kodak net sales revenues. Had Polaroid used the later February 1976, and, I believe, more accurate and reliable projection of profitability, and calculated based on 100% of operation profits, the royalty rate would be about 16.2%.

2. The willingly negotiated royalty rate.

I approach this method with the comforting reminder of Chief Judge Markey:

The methodology encompasses fantasy and flexibility; fantasy because it requires a court to imagine what warring parties would have agreed to as willing negotiators; flexibility because it speaks of negotiations as of the time infringement began, yet permits and often requires a court to look to events and facts that occurred thereafter and that could not have been known to or predicted by the hypothesized negotiators.

*74 *Fromson*, 853 F.2d at 1575. I am mindful that it is unrealistic to consider the parties as truly "willing" participants. In these hypothetical negotiations, we must consider the patents valid and infringed and that the parties were fully informed as to this fact. *Panduit*, 575 F.2d at 1158-59. With the assurance that some element of uncertainty will exist, but having in mind that the royalty arrived at must be "reasonable" under the circumstances, I turn to what I believe are the controlling facts on this issue.

First, I do not accept Polaroid's assertion that the parties would not have negotiated a license under any circumstances. Their history reflects a long standing policy to share technological advances, to supply materials to each other, and to license processes and products. I believe the record is clear that, prior to this lawsuit, the parties, especially Dr. Land, demonstrated mutual respect and recognition of each other's accomplishments and abilities. There was much to negotiate. In his testimony, Mr. McCune stated that Kodak would not commit to supply Polaroid with color negative for instant film unless a license were granted. This arrangement would have benefitted Polaroid. The question is not whether Polaroid *would* have licensed Kodak; the question is *at what price* would Polaroid have licensed Kodak. The highest rate of all licenses negotiated between the parties was 2.5%; the average was 1.7%. For its successful 110 and 126 Instamatic camera and film, and its Disc photography, Kodak negotiated a royalty rate of two percent or less. Similarly, Polaroid's licenses averaged 4.9%. Mr. Chandler testified that five percent was the highest rate he would have accepted.

Second, while the issue of an acceptable non-infringing substitute has been laid to rest, I believe the record shows convincingly that Kodak never envisioned instant photography as a replacement for conventional photography. This was a vision devoutly believed and expressed by Polaroid executives, particularly Dr. Land and Dr. Young. Instant photography was not essential to Kodak's continued presence in the photography market. At most, instant merely supplemented Kodak's conventional photography business, a welcome development owed to Kodak's stockholders, a necessary component of Kodak's reputation as a dominant figure in all phases of the photography industry. The later revenues and profits projected by Kodak constituted only a minor percentage of its overall business. Instant photography would not have promoted the sale of Kodak's main products, conventional camera and film. See *Deere v. International Harvester Co.*, 710 F.2d 1551, 1558-59 [218 USPQ 481] (Fed.Cir.1983). In this time period, instant photography never accounted for more than eight

percent of the entire-picture taking industry and not more than three percent of Kodak's sales. It was in a sense a competing product, but not a threat to Kodak's future. Mr. McCune testified that the problem was whether Polaroid could survive with Kodak in the market. The record persuades me that Polaroid would have survived and prospered with Kodak in the market at a reasonable royalty rate which provided Polaroid with a substantial share of Kodak profits. I also note that in negotiating a license with Kodak, Polaroid was not precluded from negotiating with other manufacturers as well.

*75 This section would not be complete without another reminder of the dismal failure of both parties to accurately project the future. Both sides seriously overestimated the demand for instant photography and the price the consumer was willing to pay for it. Both sides, Polaroid more grievously because of the single nature of its business, underestimated the impact of 35mm picture-taking and film developing.

[8] Considering all the factors applicable to *either* approach, and taking into account all of the facts and circumstances, I conclude Polaroid and Kodak would have negotiated in good faith and, taking into account all of the information available to both sides, would have agreed upon a royalty of ten percent, or slightly more than sixty percent of Kodak's anticipated profits through 1986 on those sales of camera and film on which lost profits were not sufficient or could not be proved. I also conclude that, independently of any negotiated royalty rate, and after an analysis of Kodak's February 1976 projections, a royalty rate of ten percent is fair compensation. In my judgment, under either approach a ten percent royalty rate will "adequately compensate" Polaroid under section 284.

VIII. Willfulness

This section address the question of whether Kodak willfully infringed the seven patents at issue, thus permitting "increased damages up to three times the amount found or assessed" above, pursuant to 35 U.S.C. § 284. The answer requires a patent-by-patent analysis in light of the applicable legal standards.

Legal Principles

The willfulness inquiry is, by necessity, a fact-sensitive one. Conduct clearly evidencing good faith and reasonableness in one context may fall far short in another; identical factors may be assigned substantially different weight depending on the totality of the circumstances. Radio Steel & Mfg. Co. v. MTD Products, Inc., 788 F.2d 1554, 1559 [229 USPQ 431] (Fed.Cir.1986). One important factor courts consider is whether the infringer timely obtained, and took into

account, the opinion of qualified patent counsel before taking the actions eventually found infringing. Rite-Hite Corp. v. Kelley Co., 819 F.2d 1120, 1125 [2 USPQ2d 1915] (Fed.Cir.1987). Simply obtaining an opinion of counsel, however, will not insulate the infringer. Machinery Corp. of America v. Gullfiber AB, 774 F.2d 467, 472 [227 USPQ 368] (Fed.Cir.1985). Reliance on counsel's opinion must be reasonable in the circumstances. See Datascope Corp. v. SMEC Inc., 879 F.2d 820, 828 [11 USPQ2d 1321] (Fed.Cir.1989), *cert. denied*, 110 S.Ct. 729 (1990).

[9] In order to recover punitive damages, the patentee shoulders a considerable burden. It must prove willful infringement by clear and convincing evidence. E.I. DuPont de Nemours & Co. v. Phillips Petroleum Co., 849 F.2d 1430, 1439-40 [7 USPQ2d 1129] (Fed.Cir.), *cert. denied*, 109 S.Ct. 542 (1988). Ordinary patent suits can be hard-fought and involve close or novel questions about which reasonable minds, in good faith, may disagree. See Kloster Speedway AB v. Crucible Inc., 793 F.2d 1565, 1579 [230 USPQ 81] (Fed.Cir.1986). What distinguishes willfulness is evidence that the infringer deliberately disregarded the patent or flagrantly disregarded the patent laws and had no reasonable basis for believing it had the right to act as it did. Stickle v. Heublein, Inc., 716 F.2d 1550, 1556 [219 USPQ 377] (Fed.Cir.1983); Dickey-John Corp. v. International Tapetronics Corp., 710 F.2d 329, 349 [219 USPQ 402] (7th Cir.1983).

*76 The theme for Polaroid's willfulness charge is based on a single assertion. According to Polaroid, *no* skilled attorney would have advised Kodak that the patents in suit were invalid or not infringed by Kodak's instant film and cameras. In its turn, Kodak states that, as it developed its integral instant photography system, it repeatedly obtained validity and infringement opinions from Francis T. Carr, a leading national expert in patent clearance and unabashedly praised by Polaroid's counsel throughout the damages portion of the trial. Since Mr. Carr's advice to Kodak was so at odds with the advice Polaroid contends any skilled attorney would have rendered, Polaroid asks the Court to believe that Kodak somehow either manipulated Mr. Carr, or the information Carr received, in order to reach a result desired by Kodak, namely, various opinions of counsel that ratified and masked Kodak's willful infringement of Polaroid's patents. That dog will not hunt. Polaroid has failed to produce a single shred of evidence that supports this claim, as the following review of the record demonstrates.

Findings of Fact

Kodak retained Mr. Carr and his firm, Kenyon & Kenyon, at the inception of its instant integral photography program, seven years before producing its

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first commercial product. During the lengthy and detailed patent clearance process he performed for Kodak, Mr. Carr considered over 250 Polaroid and non-Polaroid patents and rendered 67 written and countless oral opinions on both the film and camera patents. A patent-by-patent analysis follows.

(a) *The '821 Patent: Polymeric Acid Layer*

The '821 patent had issued before Kodak launched its integral photography program and it was one of the first Mr. Carr considered. His analysis of the patent and Kodak's product spanned four years, included four written opinions, and demonstrates the exceptional care and skill Mr. Carr brought to the task.

The crux of the '821 patent, in Mr. Carr's opinion, was the location and function of the polymeric acid layer in the instant film unit. The Polaroid patent describes the acid layer as part of the "photosensitive element" in a peel-apart unit, where it functions to stop the development process and sufficiently reduce the alkali after development to prevent oxidation and give the final image bright and stable colors. In Kodak's PR-10 integral film unit, the acid layer is located on one of the film supports--not, in Mr. Carr's analysis, part of the "photosensitive element"--and the oxidation problem is avoided because the developer is not exposed to the air. Mr. Carr thus advised Kodak that its product did not infringe '821 and further advised that '821 was obvious in view of prior art.

Judge Zobel determined that '821 was valid and infringed by Kodak's PR-10 film unit, rejected obviousness based on prior art, and observed that "[c]onflicting definitions of 'photosensitive element' in other Polaroid patents do not save PR-10 from the claim of infringement." 641 F.Supp. at 838. Polaroid's expert, Professor Adelman, repeated this refrain throughout his testimony, asserting that any "skilled attorney" would interpret the phrase "photosensitive element" differently than Mr. Carr did, adding only that Mr. Carr's advice was wrong because Claim 1 of '821 describes a process, not a structure.

*77 Probe though it did at trial, Polaroid could uncover no irregularities in Kodak's actions in obtaining Mr. Carr's opinion on '821, or in Mr. Carr's actions in formulating the advice he gave Kodak. Mr. Carr compared '821 to the prior art, reviewed the file wrapper and prosecution history, discussed the Kodak technology with Kodak engineers, and gave his considered advice, well before Kodak began manufacturing the film unit. That advice simply turned out to be wrong.

(b) *The '789 Patent: Dye Developers*

The '789 patent discloses a dye chemistry for color imaging which could serve as an alternative to the coupler chemistry of conventional color photography. At the risk of oversimplifying this complex technology, in the '789 system, during the development process, oxidation occurs and the dye developer splits off a dye molecule which transfers to the positive layer, helping create the final image. The part of the dye developer which is not oxidized remains with the negative layer.

Over the course of three years Mr. Carr reviewed more than 50 potential imaging chemistries for Kodak. Eventually, after working closely with Mr. Carr and performing tests he requested to make certain he understood how the chemistry worked, Kodak decided to use a sulfonamide process in the PR-10 film unit. In Mr. Carr's view, Kodak's chemistry avoided '789 because it involved a dye releaser that is ballasted and immobile. Furthermore, if Kodak's dye releasing chemistry was found to infringe '789, Mr. Carr believed that a prior Canadian patent also infringed and would, therefore, constitute anticipation of and invalidate '789.

Mr. Carr reached these conclusions after reviewing the '789 file wrapper, prosecution history, and prior art, and working closely with Kodak engineers. The fact that Kodak engineers occasionally used the term "dye developer" in describing their process did not change Mr. Carr's view that significant differences existed between the two processes. Judge Zobel concluded, however, that Kodak's chemistry and the '789 chemistry were functionally identical and that '789 was valid in view of prior art. Although Mr. Carr's opinion turned out to be mistaken, Polaroid has shown no reason why Kodak should have considered the opinion unreasonable or unreliable in these circumstances.

(c) *The '165-'262 Patents: Opacification/Format*

One important element that makes instant photography possible is the creation of a "darkroom" that permits the film unit to develop outside the camera. In peel-apart units, the darkroom is created by surrounding the image-receiving layer with a structural sandwich that is discarded after development. In Polaroid's integral units, the darkroom is created by using transparent supports and an opacifying agent, contained in a pod, that is released after the film is exposed and before it exits the camera. This type of opacification also obviates the need for bulky reversing optics within the camera, as the film can be exposed through one side and viewed through the other.

*78 The patent examiner initially rejected '165 for obviousness based on the prior art. Polaroid then amended the application and the patent issued. In

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reviewing the prior art and the '165-'262 patents, Mr. Carr agreed with the patent examiner's original assessment. Polaroid has not in any way shown that Mr. Carr's opinion was unreasonable or unreliable.

Polaroid makes much of the fact that at the same time it was prosecuting the '165 patent application, Harold E. Cole, one of Kodak's in-house patent counsel, filed a patent application for a substantially similar invention. Polaroid suggests that Kodak first deliberately withheld from Mr. Carr information about the Cole application, and then, after the '165 patent issued, manipulated Mr. Carr into issuing an opinion on '165 that would leave the Cole application intact.

Polaroid's arguments fail on all counts. Mr. Carr did not initially know of the Cole application because his duties involved patent clearance, not patent prosecution. When Mr. Carr did learn of Cole's application, he advised Kodak to abandon it both because it suffered from the same infirmities as '165 and because it forced Kodak into the inconsistent position of seeking a patent on the same invention Mr. Carr advised them was unpatentable. Kodak was reluctant to abandon the Cole application but, based on Mr. Carr's advice and after receiving a report from a separate task force which investigated the matter, eventually did so. If there can be found any attempt to manipulate Mr. Carr on these facts, clearly it failed. Mr. Carr's opinion and recommendations flatly contradicted Kodak's preferred course of action in this matter.

(d) *The '540 Patent: Polyester Supports*

The '540 patent discloses Dr. Land's solution to the problem of curling and distortion in the final photographic print. Rather than use water-permeable materials, which tended to dry unevenly, '540 shows the use of symmetrical supports made of impermeable polyester, using an impermeable material such as polyester for these film supports also created a "forever wet" system.

Noting the existence of the Kodak BIMAT process, dating back to 1951, which uses both symmetrical supports and a wet process, Mr. Carr advised Kodak that the only innovation contained in '540 was the use of polyester for the supports. Given that polyester was already being used in film and that DuPont was aggressively marketing its invention as a useful photographic material, Mr. Carr believed that '540 was invalid based on obviousness.

Judge Zobel, and later Professor Adelman, distinguished the BIMAT system and described the "forever wet" system as truly "inventive." Again, although Mr. Carr proved to be mistaken, Polaroid can point to no evidence

that his opinion was unreasonable or unreliable.

(e) *The '392 Patent: Rear Pick*

One Polaroid developed fairly rigid integral film unit, the mechanics of advancing the film through the camera could be modified. Initially rejected by the patent examiner, the '392 patent discloses a rear pick which pushes the film unit out of the cassette after exposure. Kodak engineers saw Polaroid's SX-70 camera demonstrated in April and May 1972. The SX-70 film had no sprockets or perforations and this led the engineers to conclude that it was being pushed through the camera, not pulled, as was the usual method for film transport at the time. Without having access to an SX-70 camera, Kodak went to work developing its own "back-picking" camera.

*79 Professor Adelman conceded that Kodak did not copy Polaroid's rear pick, but came upon the invention independently in mid-1972. Based on the prior art and differences in Kodak's pick and the route the film traversed before exiting the camera, Mr. Carr, agreeing with the patent examiner's initial decision, advised Kodak that '392 was obvious and invalid. Judge Zobel reached a different conclusion.

Polaroid belabors the fact that Mr. Carr's written clearance opinion on the camera patents, including the '392 patent, is dated April 28, 1976--two days after this suit was filed. To suggest that Kenyon & Kenyon could have prepared a 250-page report analyzing thirty-six different camera patents in just two days, all in response to this action, either overestimates Mr. Carr's abilities or underestimates the Court's common sense. In either case, the argument is specious.

(f) *The '211 Patent: Light Shield Deflector*

Before the opacifying agent bursts out of its pod as the film unit exits the camera, the photosensitive layer is susceptible to light piping within the camera. In order to reduce the ambient light within the camera, Polaroid incorporated a light shield at the film exit. The placement of the shield necessitated bending the film as it left the camera. Polaroid unexpectedly discovered that upon bending, the "goo" within the pods, which develops and fixes the final image, coated the film more evenly and efficiently, and the problematic "tongue effect" in coating diminished significantly. Kodak and Polaroid engineers called this unexpected benefit "squaring the wavefront." More efficient spreading also meant that less "goo" could be used.

The '211 patent discloses bending both to avoid light

pipng and to push the film unit against bumps on the inside roof of the camera in order to spread the "goo" more evenly. Mr. Carr reviewed the '211 claims and determined that squaring the wavefront was not one of the benefits claimed by the patent. He advised against using roof bumps in the Kodak EK-4 and EK-6 cameras and Kodak followed this advice. Because of the prior art and the failure of the patent to claim the coating benefits caused by the bend, Mr. Carr believed that '392 was invalid and not infringed. Judge Zobel disagreed, but there is no evidence that Mr. Carr's advice was unreasonable or that Kodak engineers should have known better.

The Totality of the Circumstances

Throughout the damages phase of the trial, Polaroid's counsel and Professor Adelman praised Mr. Carr, acknowledged his preeminence and expertise in the field of patent clearance, and never questioned his good faith in rendering the opinions and advice he gave Kodak over the years. Throughout Professor Adelman's testimony, however, two different themes have emerged. First, Professor Adelman stated, repeatedly and without qualification as to each of the patents in suit, that any "skilled attorney" would have recognized that the Polaroid patents were valid and that Kodak's products infringed. Second, Polaroid suggests that Mr. Carr's opinions were flawed because Kodak simply used him to ratify their knowing and willful infringement. The record clearly contradicts the first claim, as it shows a patent clearance process that could serve as a model for what the law requires. On the second claim, Polaroid has produced not a shred of evidence. The willfulness claim therefore fails.

*80 The legal standard is clear. When a potential infringer has actual notice of another's patent rights, he has an affirmative duty to exercise due care to determine whether or not he is infringing ... Such affirmative duty includes, *inter alia*, the duty to seek and obtain competent legal advice from counsel before the initiation of any possible infringing activity....

Underwater Devices, Inc. v. Morrison-Knudsen Co., 717 F.2d 1380, 1389-90 [219 USPQ 569] (Fed.Cir.1983) (emphasis omitted.) The Federal Circuit has recognized that opinions of counsel can be manipulated and concluded that there can be "no *per se* rule that an opinion letter from patent counsel will necessarily preclude a finding of willful infringement, ... nor is there a *per se* rule that the lack of such a letter necessarily requires a finding of willfulness." *Rite-Hite Corp. v. Kelley Co., Inc.*, 819 F.2d 1120, 1125 [2 USPQ2d 1915] (Fed.Cir.1987) (quoting *Machinery Corp. of America v. Gullfiber AB*, 774 F.2d 467, 472 [227 USPQ 368]

(Fed.Cir.1985)).

Not all opinions of counsel are created equal, certainly, and reliance on the opinion must be reasonable in the circumstances. Thus, in *Underwater Devices, Inc.*, above, the Court determined that the infringer was not justified in relying on the opinion of in-house counsel when counsel did not "take the steps normally considered necessary and proper in preparing an opinion," such as reviewing the file history of the patent, and the opinion itself contained "only bald, conclusory and unsupported remarks regarding validity and infringement." 717 F.2d at 1390. Similarly, in *Bott v. Four Star Corp.*, 807 F.2d 1567, 1572 [1 USPQ2d 1210] (Fed.Cir.1986), the Court found willfulness when the defendant had a long history of ignoring plaintiff's patents and counsel's oral opinion was entirely conclusory. In *Radio Steel & Mfg. Co. v. MTD Products, Inc.*, 788 F.2d 1554, 1559 [229 USPQ 431] (Fed.Cir.1986), however, the Court found no willful infringement in the totality of the circumstances even though patent counsel did not review the file wrapper or prior art before advising the defendant, orally, that the patent was invalid.

A defendant does not escape liability simply by obtaining the opinion of patent counsel. Courts have found willfulness when the infringer ignored advice of counsel and did not seek an updated opinion, *Central Soya Co. v. George A. Hormel & Co.*, 723 F.2d 1573, 1577 [220 USPQ 490] (Fed.Cir.1983), or when, *inter alia*, an opinion letter, conclusory in nature, was provided just two days before the defendant issued its first invoice for the infringing device. *Dickey-John Corp. v. International Tapetronics Corp.*, 710 F.2d 329, 332-33 [219 USPQ 402] (7th Cir.1983). In the totality of the circumstances surrounding the infringement in *Datascope Corp.*, 879 F.2d at 828, the Court found defendant's reliance on counsel's conclusory opinion unreasonable when the opinion did not address the validity of plaintiff's patents or the doctrine of equivalents, and counsel did not consult the prosecution history of the patent.

*81 The uncontroverted facts demonstrate that Kodak consulted Mr. Carr eagerly and often as it developed its instant integral photography system. Mr. Carr examined Kodak's products, sometimes even requesting additional tests in order to understand how the technology worked, and carefully studied any related Polaroid patents. The patent clearance process involved review of the file wrapper, the prosecution history, and the prior art. Of the ten patents and thirty-four different claims eventually considered by Judge Zobel, seven patents were found valid and claims infringed. Altogether, Mr. Carr reviewed over 250 Polaroid and non-Polaroid patents (containing literally hundreds of claims) and rendered

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countless oral and 67 written opinions on the entire range of products Kodak developed as part of its instant photography program. In the totality of these circumstances, Mr. Carr's advice simply turned out to be incorrect concerning the relatively few patents eventually found infringed.

Polaroid would have the Court believe that Mr. Carr's advice was mistaken on these patents because Kodak manipulated the information he received in order to have a handy file of opinions which would protect the company from later charges of willful infringement. Nothing in the record supports this claim. This is hardly the case of "damn the torpedoes, full speed ahead," where the infringer's decisions were firmly settled before consulting patent counsel. H.B. Fuller Co. v. National Starch & Chemical Corp., 689 F.Supp. 923, 952 n. 20 [7 USPQ2d 1753] (D.Minn.1988), nor was Kodak facing enormous "market pressure and urgency" that may have made reliance on counsel's inadequate opinion unreasonable. Datascope Corp., 879 F.2d at 828. Mr. Carr monitored the field for years, had access to Kodak records, reports, and personnel, and was placed under no financial constraints by Kodak. His opinions, "although later shown to be incorrect, contained significant, scientifically based objective factors to justify [defendant's] conclusion of no infringement." Studiengesellschaft Kohle m.b.H. v. Dart Industries, Inc., 862 F.2d 1564, 1579 [9 USPQ2d 1273] (Fed.Cir.1988) (emphasis deleted).

The theme is put succinctly in Stickle, 716 F.2d at 1560 n. 7:

Counterbalancing this consideration is that one who legitimately challenges the validity of a patent should not be overly penalized. Thus, a tension arises between these competing interests.

As commentators have advised:

On the one hand, the patent system requires a sufficiently severe penalty for infringement to protect the patent owner's exclusive position from pirates, but on the other hand, the public interest requires that there be a real opportunity to test the grants made by the Patent Office, without fear of a ruinous penalty for asserting a position taken in good faith.

R.A. White & L.F. Lynch, *Winning the Last Battle--The Recovery of Actual Damages in Patent Infringement*, Pat.L.Ann. 35, 36 (1970).

*82 [10] In conclusion, Polaroid has failed to show any deliberate or willful infringement of its patents by Kodak.

IX. ATTORNEYS' FEES

This section examines whether this is an "exceptional" case within the meaning of 35 U.S.C. § 285, thus permitting the award of attorneys' fees. The answer requires an overall assessment of Kodak's conduct, both during the infringement period and as a party to this litigation. Counsel have stipulated and agreed that if the Court decides to award Polaroid its reasonable attorneys' fees, \$48,000,000 would constitute the amount of those fees for the period 1976 through 1989.

[11] As a general matter, counsel fees are not awarded in patent cases. The case must be truly extraordinary and requires

a finding of unfairness or bad faith in the conduct of the losing party, or some other equitable consideration of similar force, which makes it grossly unfair that the winner of the particular law suit be left to bear the burden of his counsel fees which prevailing litigants normally bear.

Machinery Corp. of America, 774 F.2d at 471 (quoting Park-In Theatres, Inc. v. Perkins, 190 F.2d 137, 142 [90 USPQ 163] (9th Cir.1951)). An award of attorneys' fees under 35 U.S.C. § 285 serves as a deterrent to the "blatant, blind and willful infringement of valid patents," Mathis v. Spears, 857 F.2d 749, 754 [8 USPQ2d 1551] (Fed.Cir.1988), as well as to "misconduct" at trial. Rolls-Royce Ltd. v. GTE Valeron Corp., 800 F.2d 1101, 1111 [231 USPQ 185] (Fed.Cir.1986). As there is no evidence of willfulness, Polaroid has failed to meet the first test for an "exceptional" case under the statute.

Even in the absence of willful, intentional infringement, however, "misconduct during litigation, vexatious or unjustified litigation, or a frivolous suit" may warrant the award of attorney's fees. Rite-Hite Corp., 819 F.2d at 1126 (quoting Standard Oil Co. v. American Cyanamid Co., 774 F.2d 448, 449 [227 USPQ 293] (Fed.Cir.1985)). Under this second test, Polaroid has also failed to meet its burden.

First, I am familiar with the early pre-trial stages of this case. The case was assigned to me initially and it was necessary to organize and oversee the complex and voluminous discovery. All counsel cooperated fully in that effort. The case was reassigned to Judge Zobel as the result of a random distribution of cases among newly appointed additional judges. Her estimation of counsels' performance is on the record. I believe it fair to say she praised all counsel for their preparation, familiarity with and obedience to the rules, their technique and their professionalism. (Liab.Tr. 8809-10). When this case was reassigned to me after Judge Zobel's recusal, counsel

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worked diligently in preparing for the damages trial.

Second, while the trial was vigorously contested at every turn, counsel were prompt, attentive, and civil. They played by the rules. Issues were not presented in bad faith; tactics were not vexatious or dilatory; sham defenses were not employed. Despite my constant remonstrances that this case would have been more expeditiously and effectively resolved in other than a judicial setting, the failure to do so cannot be attributed to counsel. Their performance overall was exemplary. My closing statement to counsel on "Day 96" was, "if it had to be done, counsel, I'm glad it was with this group of people."

*83 Polaroid's request for attorneys' fees under section 285 is accordingly denied.

X. PREJUDGMENT AND POSTJUDGMENT INTEREST

The final subject to discuss is the award of interest. The road is clearly marked. Section 284 calls for "interest and costs as fixed by the court" and the Supreme Court has held that "prejudgment interest should be awarded under § 284 absent some justification for withholding such an award." General Motors Corp. v. Devex Corp., 461 U.S. 648, 657 [217 USPQ 1185] (1983). Prejudgment interest serves to compensate the patent holder because its damages consist not only of the lost profits or royalty payments, but also of the lost use of the money between the time of infringement and the date of the judgment. Id.; Nickson Industries, Inc. v. Rol Mfg. Co. Ltd., 847 F.2d 795 [6 USPQ2d 1878] (Fed.Cir.1988). The court shall "determine the rate of interest ... [and] whether it shall be simple or compounded." Fromson v. Western Litho Plate & Supply Co., 853 F.2d 1568, 1574 [7 USPQ2d 1606] (Fed.Cir.1988). The court has substantial discretion to determine the interest rate in patent infringement cases. Gyromat Corp. v. Champion Spark Plug Corp., 735 F.2d 549, 556-7 [222 USPQ 4] (Fed.Cir.1984).

The parties agree that an award of prejudgment interest is appropriate here and differ only as to the proper rate and the method of computation. As usual, their differences are vast and complicated. Polaroid seeks an award of prejudgment interest at the prime rate compounded annually from 1976 to 1990. Elaborate computations were submitted through Mr. McNamara, Polaroid's accounting expert, and supported by Professor Roman Weil. In equally elaborate and complicated computations submitted by Professor Stewart Myers based on a cash flow analysis by Professor Robert Anthony, Kodak urges an award based on short-term Treasury bill rates.

Interest rates vary widely depending on many factors.

Indeed, at one point in this litigation, Polaroid argued for an interest award based on *either* the prime rate or United States Treasury securities. Commercial interest rates vary depending on the customer, time to maturity, costs incurred by the lenders, differing levels of risk, and costs of other services associated with the loan. While the institutional rates discussed here are not normally affected by those factors, even these rates are subject to wide variations. Between January 1976 and September 1990, the prime rate fluctuated from a low of 6.25% to a high of 20.50%. The average prime rate was slightly over eleven percent. The Treasury bill rate also varied widely during that period, from 4.44% to 17.83%. (DF 61,762). The average Treasury bill rate was slightly over nine percent.

The parties not only differ on the rate, but upon *what* to base the rate, namely, pre-tax or post-tax profits. Kodak argues that only an after-tax calculation will avoid an undeserved windfall to Polaroid. Because Polaroid would have had to pay taxes on any profits the company earned, it lost only the time value of money on *after-tax* amounts. Normally, this would not be an issue because, of course, judgments are taxed and Polaroid must pay taxes now. However, Kodak argues that because the tax rate *now* is lower than it was *then*, if Polaroid is awarded interest on pre-tax amounts, it will in effect be earning interest on money it never had to invest.

*84 Kodak's argument is an appealing one, but I reject it in this case for a number of reasons. First, I do not believe it sound to calculate interest to be paid *now* based on tax rates in effect at the time the injury was sustained. That approach lends itself to unbounded speculation and uncertainty and can result in a potential windfall to either party. I have no basis upon which to decide how Polaroid could have sheltered that income and any effort to learn would have complicated this area unnecessarily.

Second, an award based on after-tax amounts could result in double taxation. Any award will certainly be scrutinized by tax officials at both the state and federal levels who will determine the correctness and applicability of the rate employed. Third, even if I were to accept the windfall argument, I have taken it into consideration in setting the rate and, in my judgment, avoided the uncertainty of the need to "gross up" the award, avoided excess compensation, and arrived at a fair damages award. Finally, I have not been given any convincing precedent on this issue.

Turning to the record, it is a sparse one and unavailing to me in attempting to determine how Polaroid would have successfully invested additional profits. There is no evidence that the company borrowed money at any particular interest rate or that it was in dire financial

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condition and forced into the borrower's market at high rates during the infringement period. There is no evidence of any corporate policy to re-invest a certain percentage, or to purchase certain interest-bearing securities, or to contribute to employee or stockholder profit-sharing plans.

[12] After consideration of all the factors and having in mind that the goal to be achieved is fair and adequate compensation, I conclude that an award of prejudgment interest should be based on the Treasury bill rate for the period of April 1976 to this date, compounded annually. See Appendix IV.

Post-judgment interest is to be computed daily from the entry of judgment to the date of payment, compounded annually pursuant to 28 U.S.C. § 1961(a)(b).

XI. CONCLUSIONS AND AWARD

1. Kodak's infringement of any one or more of the patents in suit was not willful and deliberate.

2. In accordance with 35 U.S.C. § 284, the amount of damages adequate to compensate Polaroid for Kodak's infringement is \$454,205,801.00. The prejudgment and postjudgment interest award to date is \$455,251,766.00. The total award is \$909,457,567.00.

3. Costs will not be taxed against either party.

4. Polaroid is not entitled to its reasonable attorneys' fees because this is not an "exceptional case" within the meaning of 35 U.S.C. § 285.

Judgment will issue in accordance with this award.

So ordered.

FN1. Of course, section 284 allows the Court to increase the damages up to threefold if the infringement is found to be willful. Section 235 permits the award of attorneys' fees in an "exceptional case." Those questions are discussed in Sections VII and IX.

FN2. This later generation of cameras were called "pack" cameras because the film came in square packs as opposed to the earlier models which used traditional roll film.

FN3. The trial transcript is cited as "TR". Exhibits are designated "PT" for plaintiff, Polaroid, and "DF" for those introduced by the defendant, Kodak.

FN4. The EK-2 was known as the Handle because of its configuration which gave the user a handle to hold with one hand while using the other hand to steady the camera and press the shutter button.

FN5. The question of whether Polaroid would have made these price cuts without Kodak is addressed in Part III, Section B, 2(a).

FN6. While Kodak does not dispute that Polaroid is entitled to demonstrable lost profits for the period following the injunction, that is, from January 8, 1986 through 1990, Kodak asserts Polaroid is estopped from making that claim because it had never indicated in pre-trial proceedings that it intended to pursue that claim and had resisted discovery. I denied Kodak's motion to bar Polaroid's claim for that period because I found the record adequately alerted Kodak to the full extent of Polaroid's claim.

FN7. This is not true in Japan, where Fuji began selling instant cameras and film in 1981.

FN8. I consider the exact amount of lost sales when I consider Polaroid's distribution capabilities in this market. See Section (b).

FN9. Note, however, that in some Polaroid subsidiary markets, Polaroid's dedicated sales force was frequently as large or larger than Kodak's sales force. (PT 2515; PT 2487; PT 2494; PT 2499; PT 2505; PT 2521).

FN10. Before trial, I ruled that Polaroid was entitled to the damages suffered by its foreign subsidiaries and foreign distributors.

FN11. Professor Buzzell, Mr. Samper, and Dr. Young, the one-time head of Polaroid's international operations, all agreed. Professor Dolan testified that it was the "conventional wisdom" that having a subsidiary was better but he believed that it depended on whether the market could support one. This issue is only relevant in determining whether Polaroid's lack of a subsidiary in any given market would have prevented it from making sales in a market where a Kodak subsidiary operated. Presumably, at least for Kodak, which sold both instant and conventional products, those markets could support a subsidiary and, in the "conventional wisdom," Kodak had an advantage.

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FN12. Argentina, Australia, Brazil, Canada, France, Germany, and Mexico.

FN13. One possibility would be to survey Kodak purchasers during this time period and ask what their motivations were in purchasing their camera. See, e.g., *Bio-Rad Laboratories, Inc. v. Nicolet Instrument Corp.*, 739 F.2d 604, 616 [222 USPQ 654] (Fed.Cir.), cert. denied, 469 U.S. 1038 (1984); Skenyon and Porcelli, *Patent Damages*, 70 J.Pat.Off.Soc'y 762, 782 (1988). Of course, there would be problems with this data; consumers might not remember, may be unable to recognize how they were influenced, or may be biased from subsequent events. Kodak attempts to support its claim that a significant number of Kodak purchasers would not have brought Polaroid by offering a survey done at the time Kodak was ordered from the market. The survey asked Kodak purchasers whether they would like to receive a Polaroid camera or a conventional Kodak camera in place of their Kodak instant camera. (DF 21,579). Many preferred to receive a conventional camera.

FN14. The survey did not ask the respondents whether, without Kodak, they would have forgone the purchase of instant at the time they bought it; the survey asked what type of camera customers would like at that moment, after however many years of instant camera ownership and given all the changes in the photographic market. The results, therefore, do not support Kodak's claim.

I am only attempting to explain the operation of those parts of the model which bear directly on my analysis. For an expert guide to the Kodak models, see *Two Kodak Camera Demand Models: A Guide for Non-Specialists*, by Professor Baumol. (DF 61,605). For a more general explanation of multiple regression, see Fisher, *Multiple Regression in Legal Proceedings*, 80 Colum.L.Rev. 702 (1980). (PT 2539).

FN15. In his "feature adjusted" variant model, Professor Baumol adjusted the price variable to take into account feature differences.

FN16. For the same reasons, I also reject Kodak's "nested logit" model. This alternative model attempted to measure the attractiveness of individual camera models, of the two instant brands and of the entire instant category. The model concluded that Polaroid could only

capture 24.3% of Kodak's sales over the period of infringement. Professor Baumol used the nested logit as a check on the reasonableness of his standard model. To an even greater degree than the standard demand model, the nested logit model runs contrary to my findings about the crucial influences on the demand for instant photography. Its result is equally extreme and therefore rejectable.

FN17. Professor Fisher claimed that he arrived at these prices by "fiddling. We took some price. We asked whether they produced--we looked at the results they produced. We asked whether they seemed sensible in terms of what Polaroid executives had to say; and when they seemed sensible, as I said before, we stopped." (TR 5187). In other words, Professor Fisher manipulated hypothetical prices rather than simply taking the opinion of some Polaroid officer and feeding it into the model. In addition to this questionable methodology and the astonishingly high prices, Professor Christiansen points out that the pricing pattern is also bizarre, with prices going up and down and up again. These patterns are inconsistent with Polaroid's pricing behavior in the real world before and after Kodak.

FN18. In particular, I found persuasive Professor Christiansen's testimony on the following aspects of Fisher's model: incomplete foreign data; the lack of a model for the "rest of the world"; the use of the 35mm stock variable; the inelastic nature of the film burn equation; the substantial variation in the film burn rate depending on the country; the use of the same film burn rate in the years three through eight; the separate treatment throughout the model of low- and mid-range cameras; the odd purchase pattern resulting from the search rate; the substantial variation in the percent of probable buyers, the search rate results and the re-purchase rate across countries; the large number of consumers who are assumed to value the instant photography system at the same price and the inflexible nature of those valuations; the results of the use of the Sun technology dummy variables across countries; the odd pricing patterns; and the manner in which later introduction dates and price effects shift demand into the future.

FN19. Professor Fisher finally adopted Mr. Booth's price and introduction strategies because Mr. Booth was "in the business" and his strategy,

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massaged by Professor Fisher in his model, generated a profit value in the middle of the range the professor had calculated with his own scenarios.

FN20. This proposition in itself contradicts how consumers act in the real world because most instant cameras are bought as gifts. Presumably the buyer, who gave the camera as a gift, will not pay for the film, and therefore the price of film over the life of the camera does not have a significant effect on the purchase decision. Yet, film price is a major portion of the system price. Professor Baumol attempted and rejected a similar system price model for this reason.

FN21. Again, this essential part of Professor Fisher's model is in direct conflict with other evidence derived from market studies. Professor Baumol testified that having decided to purchase an instant camera, consumers take a relatively short time, weeks or months, to act on that decision. (TR 11311-12).

FN22. It has been very difficult to reconcile Polaroid's argument and proof on this issue. It argues that it must prove capability yet its proofs go almost exclusively to show what it theoretically could have done with little evidence as to what it reasonably could or would have done. This evidence is examined more closely under the sections entitled "Could v. Would Revisited" in both the film and camera manufacturing findings. For purposes of this discussion, I am assuming Polaroid is urging the theoretical "could have" standard. It may, in fact, be urging the proper standard.

FN23. The only difference in terms of historical resources in the two analyses is that Kodak used thirty-eight film assembly machines and Polaroid used forty-two. Polaroid actually produced film on thirty-eight assembly machines in R-2, Enschede, and for a brief period in Ireland. Another four machines were partially completed but never used for production. Mr. McNamara included those four in his in-place analysis. Mr. Smith did not. Because I am using the in-place analysis to determine what extra production Polaroid could achieve from its historical resources, I find Mr. Smith's number more accurate.

FN24. Polaroid could have met the requirement for negative coating in the New Bedford facility

in 1982. However, in 1982, assembly machines, positive sheet, and negative base coating would have fallen short.

FN25. The 10A is an additional applicator with drying capacity which was connected to the number 10 coater. It allowed for the coating of two layers, one on each side of the web, in a single pass. As a result Polaroid was able to manufacture the positive sheet with only three coating passes in W-5.

FN26. The average yield and runtime percentages are the same in Mr. McNamara's in-place, nine-month and eighteen month scenarios. (PT 2367A, Tab 23, Tab 25; PT 2393).

FN27. Kodak agrees that Polaroid had all the capacity it needed to meet the combined demand for film in 1976.

FN28. Both Polaroid and Kodak agree that the maximum rate at which Polaroid could install machines at any particular facility was one a month. Therefore, the key is how quickly the first machine can be ready. The rest follow at a rate of one a month.

FN29. It is unclear to me whether it is Mr. Smith's view that Polaroid could not have expanded capacity in 1977-1978 under *any* of Polaroid's scenarios. In PT 3156, Polaroid shows how additional film packs could be produced during this time period using Mr. Smith's building rates and starting machines 13-24 in January 1976. However, at TR 10245 and again at 10504-506, Mr. Smith indicated that his timelines do not apply if one assumes that all the machines are started at once because that assumption does not allow for the borrowing of parts or the benefit of experienced building teams. As I do not find Polaroid's scenarios likely, it is not crucial that I resolve this matter.

FN30. No such graph was presented to the Court or admitted into evidence.

FN31. I note that I am giving Polaroid the benefit of the doubt by considering the first part of Mr. Booth's testimony to apply to what Polaroid has termed the "*Panduit* theory." In its post trial papers at Facts IV-13-14, Polaroid cites all of Mr. Booth's testimony (Tr 2298-301) in support of the notion that even if Polaroid had introduced the OneStep when it did (which is

necessarily part of Polaroid's *Panduit* theory), it would have planned better without Kodak. However, I believe Mr. Booth addressed Polaroid's capability to satisfy the combined demand only when he gave the answer quoted above. At TR 2993, counsel for Polaroid stated: We are basically putting forward in our view what Polaroid could have done to accelerate its film capacity in terms of making film under the *Panduit* theory, and *beyond that* we say as a matter of fact, it would be very easy to accelerate it within the range which Mr. Booth testified to which was eighteen months. I believe the thrust of Mr. Lawrence's testimony does go to what is called the classic hypothetical argument that what [sic] Polaroid could have done in terms of capabilities. I think Mr. Booth's position goes to the notion of what Polaroid would have done if it had the field to itself.... (My emphasis). Because the record supports the possibility that Polaroid may have planned better even with the same introduction time, I consider Mr. Booth's testimony in that light.

FN32. Kodak reduced Polaroid's capabilities in each year by 4.3% to account for Polaroid's free goods and inventory pipeline needs. Polaroid, however, demonstrated that this number was not accurate. Therefore, I have not used this part of Kodak's analysis.

FN33. From 1976 to mid-1979, final assembly of all integral cameras made in the United States was done in Building N-1 in Norwood, Massachusetts. In 1977, Polaroid began assembling non-folding integral instant cameras in its facility in Vale of Leven, Scotland. In mid-1979, Polaroid moved its U.S. assembly operation to a new facility, N-4, also at the Norwood site.

FN34. The historical daily production rate that Mr. Fortner used is also questionable because it is based on the number of cameras divided by the number of days scheduled--but not the actual number of days worked. In 1976-1978, when Polaroid was often working thirteen out of fourteen days, this flaw leads to a considerable overstating of Polaroid's capabilities. Because statistics on the number of days actually worked were available to Mr. Fortner, I find this calculation troubling. It only serves to undermine confidence in the reliability of his results.

FN35. I found it necessary to slightly adjust Professor Buzzell's translation in a few instances to take into account international models and to rectify what I judge to be considerable price differences between "matching" models. In the case of international models, I used his equivalents models at DF 61,005, p. 20. I adjusted his 80 (Pronto)/20 (Pronto RF) split of EK6 sales into a 50/50 split in 1977 and 1978. In 1978, I also adjusted his 85 (Pronto/15 (Pronto RF) for the CB200 to a 60/40 split of the same models. In 1982, I changed his K970L classification to 100% Sun 650.

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